

**This language reflects the workgroup discussions since December 5, 2008.**

### **A.3. Estimate Carbon in Wood Products**

#### *Required*

The carbon in wood products is estimated herein as the average carbon that persists over a 100-year period of wood products estimated to be in use. The processes described here were adapted from the U.S. Department of Energy (DOE) 1605(b) methodology (Technical Guidelines for Voluntary Reporting of Greenhouse Gas Program, Ch. 1, Emission Inventories, Section 1) for accounting for the long-term storage of wood products. The process is provided here for convenience. Please see Smith et al. (2006) for a more detailed description as the 1605(b) procedure was adapted from this paper. The product-based estimates general procedures are found in section 1.3.2 of the 1605(b) document.

The accounting of wood products should include only those trees harvested within the project boundaries. Trees harvested outside of your forest project's physical boundaries shall not be counted as part of your wood product pool. A harvest that leads to the production of wood products within your entity must occur for the wood products pool to have value. The carbon from harvested trees is transferred to the wood products pool in the year that it was harvested and must be accounted for in this manner. The timing of this is important to keep in mind for reporting clarity and proper accounting. The amount added to the wood carbon pool for the purpose of accounting for emissions reductions in a project is the average adjusted value for wood that is estimated to still be in-use after 100 years. Additionally, in recognition of the potential duration in landfills of some portion of wood products after the end of their useful life, project developers will also report separately an estimate of this potential landfill storage over 100 years<sup>1</sup>..

Each year the volume of harvested material that creates wood products is added at the wood product specific 100 year average in use percentage as shown in the wood products worksheet below. (See table A.5 for national 100-year average in use percentages.)

#### ***Process 1. Determine amount of carbon harvested and transferred to Wood Products Pool***

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<sup>1</sup> While recognized herein as a potential storage pool, landfill stores of wood products are not accounted for in calculations of emissions reductions at this time due to the potential of change in wood flows to landfills over the lifetime of projects. Further, accounting for wood products in landfills presents significant challenges to accuracy and verification of emissions reductions at the project level.

This process applies to projects that have removed forest stocks for conversion to wood products in the reporting year. If you have no removals reported in the reporting year, you will go to process 3 to record the pool from previous years. Your annual estimate for your wood products pool must be based on the current or most recent harvest volume reported to the California Board of Equalization (BOE) or third party scaling reports. The BOE reports will include a summary of harvested volume (board feet or cubic feet) by species delivered to the point of sale. The starting point is the dry weight of wood. This may be calculated from either volume or green weight, as described below.

If you have volume measures then the conversion from volume to carbon weight is done by multiplying the cubic foot volume by the appropriate wood density factor in table A.4. This results in the biomass (lbs.) with zero moisture content. Additional specific gravities are available from the Wood Handbook (1999). Multiply the specific gravity by the density of water (62.4 lbs/ft<sup>3</sup>) to get the wood density.

If you have the weight of wood products then subtract the water weight based on the moisture content of the wood. This results in the biomass (lbs.) with zero moisture content.

Sum the weights for each species to get a total dry weight for all harvested wood. Multiply this total value by 0.5 pounds of carbon/ pound of wood to compute the total carbon weight, and then convert to tons of carbon (1 metric ton = 2,240 pounds). This value is multiplied taken to process 2 below.

**Table A.1.** Specific gravity of green softwoods and hardwoods by forest type for the Pacific Southwest (from EPA 1605(b) Table 1.4).

Forest Type	Specific Gravity of Softwoods	Specific Gravity of Hardwoods	Wood Density of Softwoods (lbs/ft <sup>3</sup> )	Wood Density of Hardwoods (lbs/ft <sup>3</sup> )
Mixed Conifer	0.394	0.521	24.59	32.51
Douglas-fir	0.429	0.483	26.77	30.14
Fir-spruce-m.hemlock	0.372	0.510	23.21	31.82
Ponderosa pine	0.380	0.510	23.71	31.82
Redwood	0.376	0.449	23.46	28.02

### ***Process 2. Accounting for mill inefficiencies***

The conversion of logs to wood products has been estimated to be approximately 67.5% efficient for the Pacific Southwest (see DOE 1605(b) Table 1.6, year 0, in use). That is, approximately 67.5% of the delivered log volume is converted into wood product volume. Where possible, the Registry will provide mill efficiencies

for each assessment area. The remainder is considered to be immediately emitted for current accounting purposes. The calculation for mill efficiency is accomplished by multiplying the carbon tons from Process 1 by 0.675. This value is taken to process 3.

**Process 3. Wood product in use accounting**

In order to account for the decomposition of harvested wood over time, a decay rate is applied to wood products based on the half-life of carbon as determined by the wood product class. The Registry will provide wood product classes for each assessment area from mill surveys within each survey area. The applicant can check with the mill where the logs are sold to determine the product categories they sell and place in the first row and appropriate column of the worksheet below. The annual reporting for a removal shall be a constant value over time since the average value over 100 years is used based on DOE 1605(b) Tables 1.8 (in use). Specific values were used where available; otherwise the miscellaneous products value was used.

**Table A.2.** Wood Products Worksheet

Metric Carbon Tons in Current Year's Wood Products from Process 2 above.						(1)
Allocate the end use of the total wood products by assigning a percentage for each class (A – K). Multiply value from (1) by percentages assigned below in order to separate wood products carbon into product classes. Insert values into boxes (3A-K) below each corresponding product class. Values in (3A-K) are carbon (metric tons) in each product class for the current year. Multiply the values in 3A-K by the 100-year in use factor and put in 4A-K.						
A	B	C	D	E	F	G
Softwood Lumber	Hardwood lumber	Softwood Plywood	Oriented Strandboard	Non Structural Panels	Miscellaneous Products	Paper
(X%)	(X%)	(X%)	(X%)	(X%)	(X%)	(X%)
(3A)	(3B)	(3C)	(3D)	(3E)	(3F)	(3G)
0.470	0.262	0.490	0.585	0.387	0.189	0.078
(4A)	(4B)	(4C)	(4D)	(4E)	(4F)	(4G)

Sum the row values of 4A-G to get the total current wood products value. Add this to the previous years' sum to carry forward. For example, if you have 10,000 tons from previous years and 3,000 tons this year, carry forward 13,000 tons in the wood products pool. Since the values incorporate a 100-year in use value there is no need to make further adjustments with time.

#### Process 4. Landfill Storage

Landfill storage estimates are not included in the wood products pool for purposes of calculating and registering reductions. This calculation is to include the independent recognition that some sequestered carbon may remain in landfill storage after use. Due to uncertainty as to the volume and duration of stores over 100 years, the figures derived from the DOE 1605(b) Table 1.9 (landfill) will not be included in the verifiable calculations of project emissions reductions but will be reported separately.

Use table A.7 to calculate the landfill storage amount. This table is filled in the same as the in-use wood products table (A.6) except there are different multipliers to use.

**Table A.7.** Landfill Worksheet

Metric Carbon Tons in Current Year's Landfill contribution from Process 2 above.						(1)
Allocate the landfill use of the total wood products by assigning a percentage for each class (A – G). Multiply value from (1) by percentages assigned below in order to separate wood products carbon into product classes. Insert values into boxes (3A-G) below each corresponding product class. Values in (3A-G) are carbon (metric tons) in each product class for the current year. Multiply the values in 3A-G by the 100-year decay factor and put in 4A-G.						
A	B	C	D	E	F	G
Softwood Lumber	Hardwood lumber	Softwood Plywood	Oriented Strandboard	Non Structural Panels	Miscellaneous Products	Paper
(X%)	(X%)	(X%)	(X%)	(X%)	(X%)	(X%)
(3A)	(3B)	(3C)	(3D)	(3E)	(3F)	(3G)
0.294	0.407	0.283	0.231	0.339	0.446	0.173
(4A)	(4B)	(4C)	(4D)	(4E)	(4F)	(4G)

Guidance will be provided as to handling the resulting numbers.